For Information

Legislative Council Panel on Transport

Mitigation of Railway Noise
at the existing KCR and MTR stations

At the Panel meeting on 22 January 1999, Members expressed concern on the design of existing MTR and KCR stations with regard to the aspect of combating noise level generated at open space of these stations by trains and maintenance works, and measures taken to minimize such nuisance caused to nearby residents.

2. The notes at Annexes A and B set out the respective policies and practices of the Kowloon-Canton Railway Corporation and the Mass Transit Railway Corporation in minimizing in noise impact at their existing railway stations.

Transport Bureau
20 April 1999

Annex A

Kowloon-Canton Railway Corporation (KCRC)

Mitigation of Railway Noise

Purpose

This note sets out the policy and practice of the KCRC regarding the mitigation of noise along its railway.

Background

2. The Corporation cares for the environment and the community we serve. It is the Corporation's policy that our rail operation and maintenance activities shall comply with the Noise Control Ordinance and that we shall review regularly the noise impact of our railway operation and the effectiveness of the noise mitigation measures.

3. The Corporation achieves this policy by -

(a) implementing intensive rail and wheel maintenance on East Rail and Light Rail to keep the noise generated from railway operation to the minimum practicable;

(b) implementing the most practical noise mitigation measures as appropriate to reduce the level of noise generated;

(c) using the latest available and proven technology wherever practicable in the design of new rolling stock and railway structures; and

(d) monitoring regularly the noise and other environmental related issues.

4. The Corporation has regular liaison with Environmental Protection Department on noise mitigation issues.

Source of Noise

(a) Railway Operation

5. Interaction of wheel and rail is the major source of noise from the operation of East Rail and Light Rail. Over 500 trains run on the East Rail from 5:35 a.m. to about 1:00 a.m. each day. Apart from electric passenger trains, there are also diesel-hauled through trains and freight trains running on the East Rail. The Light Rail commences services at 5:30 a.m. up to 1:00 a.m. and about 2 140 trains trips are operated on a daily basis.

(b) Maintenance

6. After the close of passenger traffic, both the East Rail and Light Rail will have to carry out track maintenance works in order to ensure the safety of the railway. Tamping machines and rail grinders are among the examples of the equipment used for maintenance activities. For all these overnight maintenance works, the Corporation has to apply for the Construction Noise Permit issued by the Environment Protection Department.

Mitigation Measures

7. The Corporation monitors closely the noise generated from the interaction of rail and wheel on both East Rail and Light Rail. The grinding of rail to give optimum wheel-rail contact and the welding of all joints between rail that are suitable for welding are among the ways that can help reduce the noise generated from wheel running on the rail.

8. Some operational measures have been taken in order to minimise the noise impact as felt by the residents living adjacent to the railway. For example, in preparing the train timetable, the freight trains, which generate more noise than the electric passenger trains, are scheduled to run before the late night time because the noise from train becomes more prominent when the background environment is quiet.

9. As for East Rail, by the nature of railway station design, walls that form part of the station structure and awnings on platform all provide some noise mitigation but the amount of mitigation vary from station to station depending on their individual layout.

10. Oil drum are installed at curved rail tracks of the Light Rail, so that when light rail vehicles pass through the rail tracks, the drum will automatically release lubricant to suppress the squeal produced. A resilient rubber block is also installed at all light rail vehicle wheels between the wheel tyre and wheel hub in order to absorb the noise produced by the wheels.

11. In order to minimise the noise level, acoustic covers have been installed on track maintenance machines to reduce the noise generated during operation of these machines. Portable acoustic noise sheds in the form of a tent, inside which the maintenance works are carried out, are used as far as practicable. All these machines are always well maintained to ensure no unnecessary emissions are produced. Maintenance staff are also briefed on the importance of reducing noise during track maintenance activities.

12. Since 1993, KCRC has introduced a noise reduction programme, estimated to cost over $900 million, by installing noise barrier at 29 locations along East Rail with a view to improving the environment of residents living adjacent to the railway. In early 1999, a total of five sites have been completed. The whole project will be completed in the year 2002, benefiting a total of 130 000 people.

Conclusion

13. Apart from ensuring compliance with Environmental Protection Department requirements, the Corporation is committed to continuing our efforts in exploring technological advances in noise suppression and to employ the latest and proven technology in the design of new trains and in the planning of new railway extensions, e.g. the West Rail (Phase I) which is envisaged to be built as one of the quietest railways in the world.

Kowloon-Canton Railway Corporation
20 April 1999

Annex B

Mass Transit Railway (MTR) Corporation

Mitigation of Railway Noise

PURPOSE

This note sets out the policy and practice of the MTR Corporation regarding the mitigation of railway noise.

BACKGROUND

2. It is the Corporation's Environmental Policy that the Corporation shall comply with the Noise Control Ordinance, and shall review its noise impacts on a regular basis.

3. The Corporation achieves this policy by -

(a) implementing intensive rail and wheel maintenance to reduce the wear and to keep its noise source to the minimum practicable;

(b) employing the most practical mitigation measures as appropriate to reduce the propagation of noise;

(c) utilising the latest available and proven technology in the design of new railways; and

(d) regular monitoring of noise and related issues.

4. The Corporation continues to keep abreast of the current international practices and development on rail noise and maintenance. Professional advice from railway experts in track and vehicle design and noise and vibration issues is also sought from time to time. There is frequent communication between the Environmental Protection Department and the Corporation on noise and vibration issues.

SOURCES OF NOISE

(a) **Railway Operation**

5. The main source of noise emanating from the railway is generated by the interaction between the rail and wheel. When a wheel runs along a rail, the force generated at the contact point between the wheel and rail causes both objects to vibrate. The amount of noise emitted as a result is influenced by the roughness of the wheel and the rail. The greater the roughness of the wheels and rails, the higher the noise levels. Noise is also found emitting from the rail joints which are in place to ensure the safety and integrity of the signalling and power supply system. The Corporation is investigating possible ways of reducing the number of rail joints with a view to further reduce the noise.

6. Other noise sources such as the train air-conditioners, traction motors, fans and compressors also contribute to the total noise level, though to a much lesser degree.

(b) **Maintenance**

7. Maintenance activities are normally conducted at night when the trains are not operating, and are subject to a Construction Noise Permit issued under the Noise Control Ordinance. Over the years, the Corporation has employed noise control engineering principles to reduce noise from the battery-electric locomotives, fans, compressors, hand tools and the rail grinding trains. Where this has not been possible, the Corporation employs noise barriers where safety and site considerations allow. Maintenance staff are also briefed on the importance of reducing noise during track maintenance activities.

MITIGATION MEASURES

8. After a series of extensive studies, track investigations and field trials carried out by a renowned international expert on rail/wheel technology, advice has been taken on board by the Corporation which initiated the following key measures in reducing train noise -

(a) adoption of a unique wheel and rail profile;

(b) invested in a highly sensitive and automated rail grinding train to enhance the rail grinding programme, and limit excessive rail wear;

(c) fine tuned the alignment of the train wheels at regular intervals; and

(d) employed a high quality lubricant to reduce squeal and wear.

9. Rather than using mechanical braking to slow the trains and create noise, the Corporation completed a conversion programme in 1995 to use the reversal of the traction motor current to reduce the speed of the train. Not only does this minimize the noise generated from braking, but also allows a recovery of electricity, a further environmental benefit.

10. The most effective noise mitigation is to reduce the noise at source. **Wheel dampers** are now being installed on passenger trains on the **MTR** Tsuen Wan Line, Kwun Tong Line and Island Line to reduce squealing noise. Currently, 70% of all trains are fitted with wheel dampers and the programme is on schedule for completion by the end of 1999.

11. Where mitigation at source is not possible or practical, then mitigation to the pathway between the source and the receiver is the next best solution. The Corporation has installed **noise enclosures** between Kwai Hing and Kwai Fong, between Shau Kei Wan Tunnel Portal and Heng Fa Chuen, at Tung Chung Station and Tsing Yi Station. **Noise barriers** have been implemented at Tsui Wan Estate in Chai Wan, Tung Chung, Tsing Yi and Mei Foo. Provisions for additional barriers have already been included at Tung Chung, Siu Ho Wan, Yam O, Tsing Yi and between Mei Foo and Olympic Stations. These will be implemented when required due to increasing train service as agreed with the Environmental Protection Department.

12. Where mitigation at source or in the pathway is not possible, trains can be operated at **restricted speed** at the most noise sensitive areas, i.e. the open section at Heng Fa Chuen and Tsuen Wan in the night time after 23:00 hour to 07:00 hour in the following morning. Given its potential disruption to train service for the general public, operating trains at restricted speed will only be used in exceptional cases.

13. The design of the Airport Railway has employed the latest available technology in vehicle and track design as well as individual components. Some of the additional noise reduction measures employed to achieve this are -

(a) specially designed wheel and rail profiles;

(b) specially designed vehicle and track support;

(c) silencers on traction motor;

(d) specially designed gearbox;

(e) disc brakes for electric regenerative braking;

(f) suspended floor in the vehicles;

(g) plug doors; and

(h) specially designed fans, compressor and air conditioners.

14. In addition, the use of a specially designed concrete bridge at Rambler Channel and improved design in vent shafts are also contributory factors assuring statutory compliance.

15. Rail vibrations and re-radiated noise have been practically eliminated with the use of floating slab track. This is a special track support that is designed to absorb the vibrational energy of the rails, by supporting the track on concrete trays that sit on rubber blocks. Floating slab track has been implemented between Tsuen Wan and Tai Wo Hau, between Kwai Fong and Kwai Hing, at Shek Kip Mei, Lam Tin, Central, Admiralty and at all stations of the Airport Railway.

16. The Corporation invests heavily in improving its existing railway stations and facilities. Over the last three years, capital improvement works directly related to noise mitigation on Tsuen Wan Line, Kwun Tong Line and Island Line amounted to $125 million.

MONITORING

17. The Corporation undertakes regular monitoring of noise levels along the railway. Roughness or corrugation of the rail are closely monitored.

CONCLUSION

18. The Corporation is committed to strict compliance with the environment regulations and to provide better quality of life for the community. The Corporation will continue to -

(a) maintain the railway to the best practicable standards;

(b) implement practical mitigation measures;

(c) monitor the noise emissions of the railway; and

(d) share our practical knowledge and results with the Environmental Protection Department.

19. The Corporation will also, in planning for new extensions, employ the latest and proven technology to have better built-in noise reduction features.

MTR Corporation
20 April 1999